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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/698,179	10/30/2003	Thomas W. Kenny	COOL-01302	2504

28960 7590 11/14/2006

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EXAMINER	
FORD, JOHN K	
ART UNIT	**PAPER NUMBER**
3744	

DATE MAILED: 11/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/698,179	KENNY ET AL.	
	Examiner	Art Unit	
	John K. Ford	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 8/23/2006.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-127 is/are pending in the application.

4a) Of the above claim(s) 4,5,9-12,15,18,20-27,38-40,42,43 and 45-127, is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3,6-8,13,14,16,17,19,28-37,41 and 44 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 2/3/06

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

Applicant's response of August 23, 2006 has been studied carefully. Rather than reiterate what is stated there with respect to the elected invention/species, the examiner incorporates that document by reference here. The election of the invention of claims 1-87 was made without traverse. Accordingly, no further comment is necessary. On page 19 of the response of August 23, 2006, applicant alleges that the examiner gave applicant an incomplete list from which to elect which thereby "deprives the Applicants the full scope of their invention". The examiner tried very hard not to do this, but with literally hundreds of un-illustrated variants disclosed in the specification it was almost inevitable that some permutation or combination of the species that were illustrated would be omitted from the list. With respect to the thermoelectric species, applicant's comments are well taken and any thermoelectric claims that applicant has identified as readable on the elected species are treated here because the thermoelectric device is clearly disclosed to be used with elected Figures 3A-3B on page 13 of the specification. With respect to the second argument, that the microchannel walls 110 of the interface layer 102 as disclosed on page 22, lines 19-22 ("It is also apparent that any other features, besides microchannel walls 110 are also contemplated, including, but not limited to roughed surfaces and a micro-porous structure, such as sintered metal and silicon foam"), is it is apparent that applicant is trying to elect two species at the same time. As the examiner reads the above statement, this particular embodiment may have either the microchannel walls 110 **or** a "micro-porous structure, such as sintered metal and silicon foam." Counsel then jumps to Figure 10A, another distinct species from Figure 3B (see office action of July 20, 2006 where Figure 3B and Figure 10A were

listed as first and second species of the interface layer") and argues that the statement on page 22, lines 19-22 of the specification imports all of the structure of the microporous structure 301 disclosed in Figure 10A, but omits the pillars 303 of Figure 10A. The examiner does not believe that the application as filed supports this borrowing selected features of disparate species in this manner just described. As a courtesy to applicant, and to advance prosecution to final resolution, the claims identified as readable on the elected species of 3A-3B, 10A are treated here on the merits. Since the examiner has found in applicant's favor on every aspect of applicant's traverse and all of the claims identified as readable by applicant on the elected species are treated here, the traverse is deemed moot and the election requirement is deemed proper and made FINAL.

Applicant has identified claims 1-3, 6-8, 13, 14, 16, 17, 19, 28-37 and 44 as readable on the elected species of the interface layer of Figures 3A, 3B and 10A, the first species as described of Figures 3A-3B with the thermoelectric device, the first species of heat exchanger having three layers, in particular, a fourth species of thermoelectric system, wherein the thermoelectric device is coupled to both the heat exchanger and the heat source, the species wherein the fluid does not change phase and finally the fluid providing system of Figure 2A. An action on the merits as to all of the elected claims identified by applicant (claims 1-3, 6-8, 13, 14, 16, 17, 19, 28-37 and 44) follows below. The examiner has added claim 41 to applicant's listing because

claim 44 depends from it. Therefore, an action on the merits as to claims 1-3, 6-8, 13, 14, 16, 17, 19, 28-37, 41 and 44 follows below.

Be forewarned, however, if this continues to be a burden on the examiner, the examiner may require a further election of species between the interface layer of Figures 3A-3B as shown (i.e. microchannel walls 110 of the interface layer 102) and the alternative interface layer of "a micro-porous structure, such as sintered metal and silicon foam" as disclosed on page 22, lines 19-22 of the specification as an alternative construction for the interface layer 102 of Figures 3A-3B, since these two constructions are mutually exclusive. If applicant maintains that the interface layer of Figures 3A-3B as shown (i.e. microchannel walls 110 of the interface layer 102) and the alternative interface layer of "a micro-porous structure, such as sintered metal and silicon foam" as disclosed on page 22, lines 19-22 of the specification as an alternative for the interface layer 102 of Figures 3A-3B are not mutually exclusive, specific reference to the specification by page and line number for where support that the two constructions can be used together at the same time (i.e. not as alternatives to one another) is required in response to this office action.

Claims 28-32 and 34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to

one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 28 applicant claims that the "intermediate conducting layer is made of a porous microstructure." With respect to claims 28-32 being readable on the elected species of Figures 3A-3B as shown or with the alternative interface layer of "a micro-porous structure, such as sintered metal and silicon foam" as disclosed on page 22, lines 19-22 of the specification, the examiner can find no support in the original disclosure for the intermediate layer being a micro-porous structure. In fact both the original disclosure and original claim 28 support that only the interface layer (referred to in original claim 28 as the "heat exchanging layer") and not the intermediate layer have a micro-porous structure. The intermediate layer 104 in elected Figures 3A-3B is, at the risk of oversimplifying, simply a solid plate with a bunch of through-passages (i.e. "conduits" 105A-105D) and Figure 10A lacks any disclosure of an intermediate layer.

Furthermore in the specification on page 22, lines 19-22, it states with respect to elected Figures 3A-3B: "It is also apparent that any other features, besides microchannel walls 110 are also contemplated, including, but not limited to roughed surfaces and a micro-porous structure, such as sintered metal and silicon foam". With respect to claims 29-32, there is no disclosure that the sintered metal or silicon foam disclosed to be alternatives to the microchannel walls 110 have any of the attributes

claimed in these claims. There is no evidence to support that the material disclosed at 301 in Figure 10A is in fact the one contemplated on page 22, lines 19-22.

Finally, with respect to claim 34, the only disclosure of these dimensions in the specification is with regard to the size of the "pillars" in the nonelected species. The areas of the passages disclosed in Figures 3A-3B are far larger than what is claimed here, therefore these ranges to the extent that applicant is now asserting are part of the elected invention are clearly "new matter."

Claims 28-32 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for either the microchannel embodiment of Figures 3A-3B (see elements 110) **or** the pillar and porous structure embodiment of Figure 10A (see elements 301 and 303), does not reasonably provide enablement for the kind of mix and match contemplated on page 19, lines 13-15 ("It is apparent that the interface layer 302 can include only the microporous structure 301 as well as a combination of the microporous structure with any other interface layer feature (e.g. microchannels, pillars, etc.). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. These constructions are maintained to be mutually exclusive because, for example, how the porous mat 301 of Figure 10A could be assembled with the microchannel fins 110 of Figures 3A-3B is not explained. The two (the porous mat 301 of Figure 10A could be assembled with the microchannel fins 110 of Figures 3A-3B)

cannot take up the same place at the same time. The specification, drawings and original claims, to the extent they are readable on all of Figures 3A, 3B and 10A **simultaneously** do not provide this scope of enablement.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 3, 6, 7, 8, 13, 14, 16, 17, 19, 33, 34, 35, 36 and 37 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Herrell et al. (USP 4,758,926).

Herrell shows a body 10 having a planar conducting portion 40. Plural heat sources 36 are shown. An intermediate conducting layer 44 is shown. The body has an inlet port 14 and an outlet port 16. Fluid from the inlet port is channeled to the conducting portion 40. The microchannels 42 in the conducting portion 40 distribute the

fluid (after exchanging heat with the heat sources 36) after it has passed "therethrough" (i.e. through the microchannels 42 in the conducting portion 40) to the intermediate conducting layer 44. The intermediate conducting layer 44 has fluid passing through it in through-passages (best seen running vertically between manifolds 48 and 50 in Figure 6 of Herrell) that fluidly connect the microchannels 42 in the conducting portion 40 to passages in the top layer 46 for eventual discharge from outlet 16. Regarding claim 2, applicant's "first layer" is the bottom layer 40 in Herrell and the intermediate conducting layer 44 is configured between it (the first layer) and the applicant's claimed "second layer" (i.e. layer 46 in Herrell). Regarding claim 3, microchannels 42 are shown as recesses in layer 40. Regarding claim 6-8, second layer 46 includes the inlet port 14, outlet port 16 and the inlet port 14 is substantially parallel to the plane of the second layer 46. Regarding claim 13, grooves (i.e. long narrow channels) are shown in Figure 5 channeling fluid from one of the manifolds 50 (each of which is connected to the intermediate conducting layer) to an adjacent manifold 50 and eventually to the outlet 16. Claim 14, is satisfied because Herrell does not disclose any boiling or vaporization of the heat exchange fluid. Alternatively claim 14, being a method of use limitation in an apparatus claim is not a limitation on the apparatus itself (for further explanation, see MPEP 2114, incorporated here by reference). Regarding claim 16, layer 40 is 25 mils thick. Each mil is 25.4 microns. Layer 40 is therefore 635 microns thick. 635 microns is 0.635 millimeters, within applicant's claimed range. Regarding claim 17, in Figure 3, left hand side there is no overhang shown between layer 40, 44 and 46. Since there is no overhang and applicant's claimed range includes an overhang of "0" (i.e. zero)

millimeters, this limitation is met by Herrell. Regarding claim 19, while the preferred material of manufacture in Herrell is silicon, metal is also disclosed in column 9, line 29-32. The thermal conductivity of silicon is approximately 120 W/mK and can be looked up in standard handbooks, so claim 19 is met by Herrell. Metals, generally, have even higher thermal conductivities than silicon. Regarding claim 33, see microchannels 42 in layer 40 of Herrell. Regarding claim 34, some (small) portion of each of the microchannels 42 of Herrell must be within this range and to the extent that applicant's own disclosed microchannels are described by this limitation, so too are the microchannels of Herrell. Regarding claim 35, the height of the microchannels is 9.3 mils. That is 236 microns (about 240 microns as disclosed by Herrell in col. 6, lines 15-17), within applicant's claimed range. Regarding claims 36 and 37 the spacing dimension in Herrell is 80 microns and the channels are each 80 microns wide, within applicant's claimed ranges.

Claims 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Herrell as applied to claim 1 above, and further in view of O'Neill et al (USP 4,896,719) and Tonkovich (USP 6,680,044).

To have replaced the microchannel layer (40) of Herrell with the corresponding porous layer construction of O'Neill (i.e. skin 15 and adjoining expanded foam 25) would have been obvious to one of ordinary skill in the art to advantageously obtain extremely even cooling without any temperature gradients as would occur when their were

discrete heat transfer zones as is the case in Herrell. As disclosed the porosity of the expanded foam should be such that heat exchange medium flows freely. With respect to claims 29-30 applicant has shown no criticality whatsoever and the art recognized tradeoff between getting adequate heat transfer and avoiding excessive pressure drop suggests that the variables being claimed are ultimately for the designer to select in any given heat transfer application. To have configured the porous intermediate layer of Herrell/O'Neill with a porosity that is known to provide good fluid flow as taught by Tonkovich in col. 2, lines 50-63, incorporated here by reference, would have been obvious to one of ordinary skill in the art to advantageously obtain extremely even cooling without any temperature gradients as would occur when their were discrete heat transfer zones as is the case in Herrell.

Claims 1, 28 and 32 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over O'Neill (USP 4,896,719).

O'Neill shows a porous intermediate conducting layer 25 sandwiched between a conducting portion (layer 15) and another porous layer 12. An inlet 16 and outlets 24 are shown. As disclosed the porosity of the expanded foam should be such that heat exchange medium flows freely. With respect to claims 29-30 applicant has shown no criticality whatsoever and the art recognized tradeoff between getting adequate heat transfer and avoiding excessive pressure drop suggests that the variables being claimed are ultimately for the designer to select in any given heat transfer application.

Regarding claim 32, every foam material by the nature of its formation is formed with irregular pores that inherently vary randomly over the flow path as a consequence of their random orientation.

Claims 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neill et al (USP 4,896,719) as applied to claim 1, 28 and 32 above, and further in view of Tonkovich (USP 6,680,044).

To have sized the pores of O'Neill (i.e. expanded foam 25) as taught by Tonkovich would have been obvious to one of ordinary skill in the art to advantageously obtain reasonable fluid flow. As disclosed the porosity of the expanded foam should be such that heat exchange medium flows freely. With respect to claims 29-30 applicant has shown no criticality whatsoever and the art recognized tradeoff between getting adequate heat transfer and avoiding excessive pressure drop suggests that the variables being claimed are ultimately for the designer to select in any given heat transfer application. To have configured the porous intermediate layer of O'Neill with a porosity that is known to provide good fluid flow as taught by Tonkovich in col. 2, lines 50-63, incorporated here by reference, would have been obvious to one of ordinary skill in the art to advantageously obtain good fluid flow without unreasonable pressure drops.

Claims 41 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over any of the prior art references as applied to claim 1 above, and further in view of Cardella (USP 5,918,469) or WO 01/25711 A1 (cited by applicant).

Cardella teaches a thermoelectric cooler 24 between a heat source (an integrated circuit chip 22) and a liquid-coolant type heat exchanger 20. To inserted a thermoelectric cooler between each of the integrated circuits 36 of Herrell and the bottom layer 40 of Herrell to advantageously cool the integrated circuits even more would have been obvious to one of ordinary skill in the art in view of Cardella. Alternatively, to have replaced heat exchanger 20 of Cardella with the microchannel heat sink assembly 12 of Herrell to advantageously improve cooling in Cardella would have been obvious to one of ordinary skill in the art.

Finally, to have replaced either or both of the heat sink assemblies of WO 01/25711 A1 (cited by applicant) best seen in Figure 2 (18 and 19 at the bottom and 15 and 16 at the top) with the heat sink assembly 12 of Herrell would have been obvious to one of ordinary skill in the art to improve the cooling performance by advantageously reducing the length of the fluid flow paths.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John K. Ford whose telephone number is 571-272-4911. The examiner can normally be reached on Mon.-Fri. 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler can be reached on 571-272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

jkf

John K. Ford
Primary Examiner